



MISSOURI DEPARTMENT OF
**HEALTH &
SENIOR SERVICES**

ANTIMICROBIAL-RESISTANT INFECTIONS IN MISSOURI

Report to the Governor and General Assembly, January 2025

**Missouri Department of Health and Senior Services
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ANTIMICROBIAL-RESISTANT INFECTIONS IN MISSOURI

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Executive Summary

Annual reports shall be made regarding antimicrobial infections in Missouri per RSMo Section 192.667.21. Data sources in this report include laboratory reports and reports by healthcare providers to the Missouri Department of Health and Senior Services (DHSS). This data was collected through quarterly aggregate reports and via investigations of healthcare-associated infections (HAIs), previously referred to as “nosocomial” infections.

The “Missouri Nosocomial Infection Control Act of 2004” mandated that both healthcare-associated methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant *Enterococci* (VRE) be included in the list of reportable diseases and/or conditions. Carbapenem-resistant *Enterobacterales* (CRE) were added to the list of reportable conditions in Missouri in 2018. The final CRE case definition was released in December of 2018.¹ Facilities began reporting CRE data in the fourth quarter of 2018. Other emerging HAIs are reported in accordance with the requirements outlined in 19 CSR 20-20.020.

It should be noted that the data provided are case counts, not rates of infection. The reported cases included in this report should not be considered a representative of all antimicrobial-resistant infections in Missouri. The reporting period for the Missouri specific data included in this report is from Quarter 4 of 2023 through Quarter 3 of 2024 (October 1, 2023 – September 30, 2024). Regions are reported in accordance with the DHSS Bureau of Communicable Disease Control and Prevention (BCDCP) map. See Figure 1.

Disclaimer:

Due to variability in individual facility reporting capacity, data sources, and reporting requirements between state and federal agencies, data included within this report are provisional, as of December 1, 2024, and may be subject to change.

A consumer who is choosing a facility for healthcare should consider the advice of their physician or healthcare provider, the experience of facility staff, and all the other factors that are unique to their situation, in addition to the infection data reported to DHSS. An additional resource for consumers can be found here at Medicare.gov [Care Compare](#).

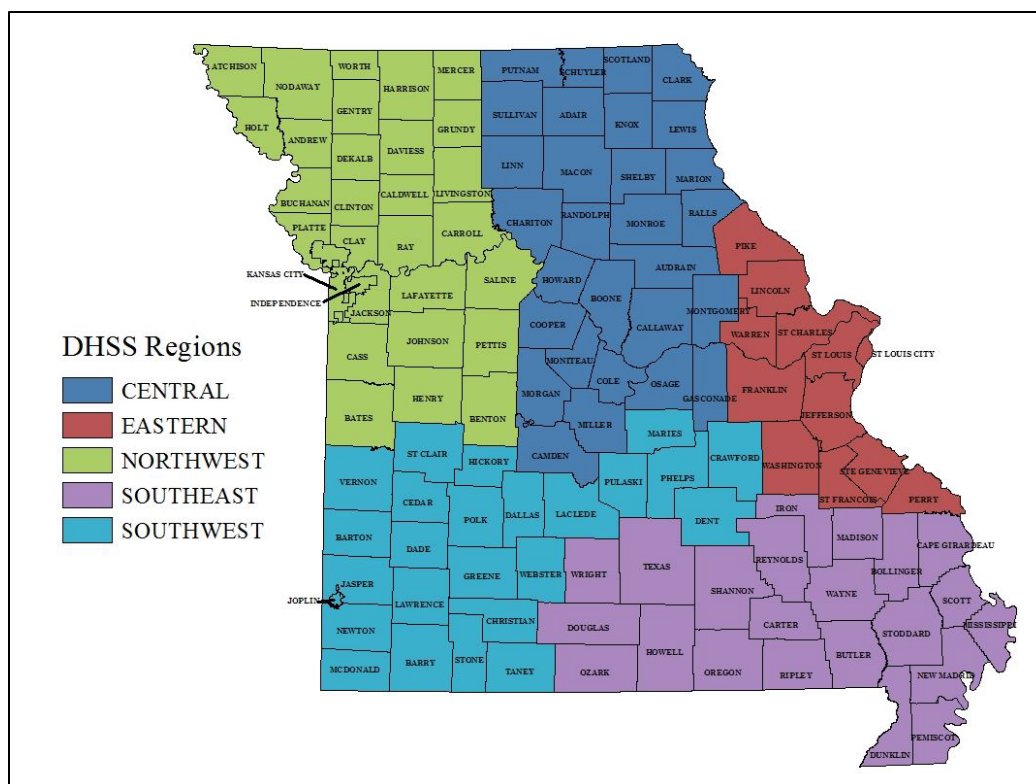


Figure 1: BCDP Regions

About Antimicrobial-Resistant Infections

The introduction of antibiotics has greatly reduced morbidity and mortality worldwide. However, overuse of these medications has caused bacteria to develop resistance to antibiotics making infections harder and more expensive to treat. Some bacteria have even become pan-resistant, or resistant to all antibiotics. In addition, some antibiotic-resistant bacteria can even share the genetic material that causes antibiotic resistance with other bacteria that have not developed this ability on their own. According to the “Antibiotic Resistance Threats in the United States: 2019” report by the Centers for Disease Control and Prevention (CDC), more than 2.8 million antibiotic-resistant infections occur each year in the United States, and more than 35,000 people die as a direct result of these infections.² Antibiotic resistance is an urgent public health concern.

Every 1 in 31 hospital patients and 1 in 43 nursing home residents contracts a HAI

While antimicrobial-resistant infections have a high priority within the scope of HAIs, they are not the sole concern. In general, HAIs are infections that patients or residents contract while receiving health care within any type of healthcare facility. These infections may be associated with the use of invasive medical devices, such as central venous catheters or urinary catheters, surgical procedures, or gaps in infection prevention and control practices. The CDC estimates that on any given day, about 1 out of every 31 hospital patients and 1 in every 43 nursing home residents contracts at least one HAI during their episode of care.³ These rates highlight the importance and continued need for having a robust program responsible for encompassing HAI surveillance and investigation, infection prevention, and antimicrobial stewardship efforts.

Aggregate Reporting

Methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *Enterococci* (VRE), and carbapenem-resistant *Enterobacterales* (CRE) are all bacteria that have antibiotic resistance and are typically acquired after having healthcare exposures. Infections with these organisms can range from skin infections to pneumonia to bloodstream infections, among others. These organisms can be transmitted unknowingly on the hands, medical equipment, and high-touch surfaces.⁴ VRE and CRE are resistant to antibiotics that are drugs of last resort.⁵⁻⁶ It is also important to prevent spread in healthcare settings, as patient and resident mortality can range from 20-50% for these organisms depending on site of infection and specific patient factors.⁷⁻⁹ Some CRE can produce carbapenemases, enzymes that breaks down carbapenem antibiotics. These are known as carbapenemase-producing CRE (CP-CRE). Both healthcare-associated CRE and CP-CRE are included as reportable CRE conditions based on the updated reportable conditions requirement from 2018.

MRSA, VRE, and CRE are all reportable as part of the quarterly aggregate reporting requirement for HAIs. These cases are reported from hospitals and ambulatory surgery centers throughout Missouri. It is important to note that regional cases are assigned based on the address of the healthcare facility where an individual sought care rather than the address of an individual's residence. Therefore, these numbers do not represent the full geographic distribution of these organisms within Missouri. This undoubtedly results in greater case counts in districts with more healthcare facilities.

Table 1: Number of Missouri Healthcare-Associated MRSA Cases (October 1, 2023 – September 30, 2024)	
BCDCP Region	No. of Cases
Central	38
Eastern	548
Northwest	218
Southeast	40
Southwest	92
Statewide Total	936

Table 2: Number of Missouri Healthcare-Associated VRE Cases (October 1, 2023 – September 30, 2024)	
BCDCP Region	No. of Cases
Central	7
Eastern	111
Northwest	105
Southeast	14
Southwest	28
Statewide Total	265

Table 3: Number of Missouri Healthcare-Associated CRE and CP-CRE Cases (October 1, 2023 – September 30, 2024)		
BCDCP Region	No. of CRE Cases	No. of CP-CRE Cases
Central	25	2
Eastern	332	111
Northwest	269	26
Southeast	105	6
Southwest	47	11
Statewide Total	778	156

Carbapenemase-Producing Organisms

Carbapenemase-producing organisms (CPOs) are a specific subset of carbapenem-resistant organisms. CPOs refer to many different species of bacteria that can produce carbapenemase genes, such as KPC, VIM, OXA-48, OXA-23, OXA-24 and/or IMP. Common CPOs of concern are CP-CRE, as well as carbapenem-producing *Acinetobacter baumannii* (CP-CRAB), and carbapenemase-producing *Pseudomonas aeruginosa* (CP-CRPA). CPOs often contain mobile genetic elements, known as

plasmids, which can facilitate transmission of these resistance genes within and between bacterial species.¹⁰ These organisms are transmissible between patients and can be inadvertently carried on medical equipment and hands of healthcare workers. These factors make CPOs an emerging public health threat that require heightened surveillance and timely follow-up investigations. CPOs are reportable according to 19 CSR 20-20.020 and are to be reported immediately upon detection to the DHSS Healthcare-Associated Infections/Antimicrobial Resistance (HAI/AR) Program for further follow-up. Please note, CPO reporting is different from the quarterly aggregate CRE reporting requirement.

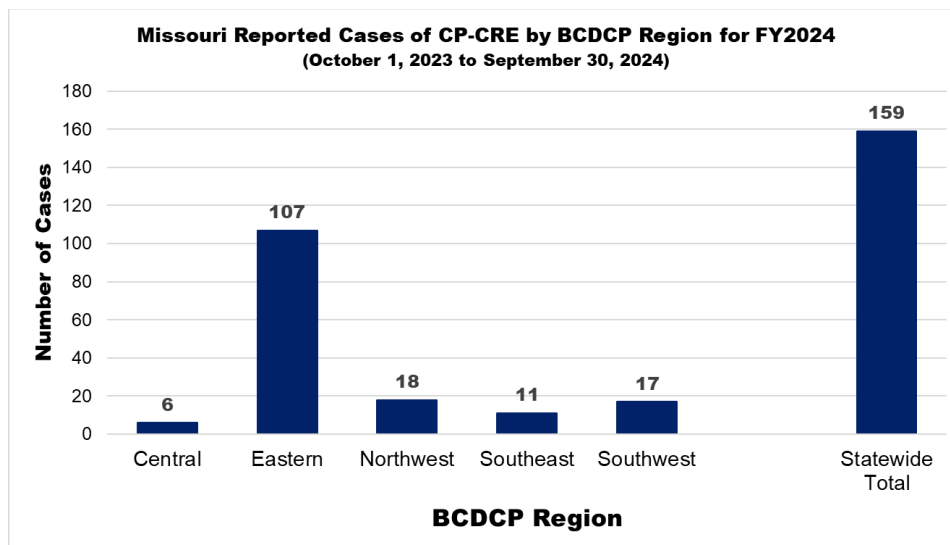


Figure 2: CP-CRE Cases

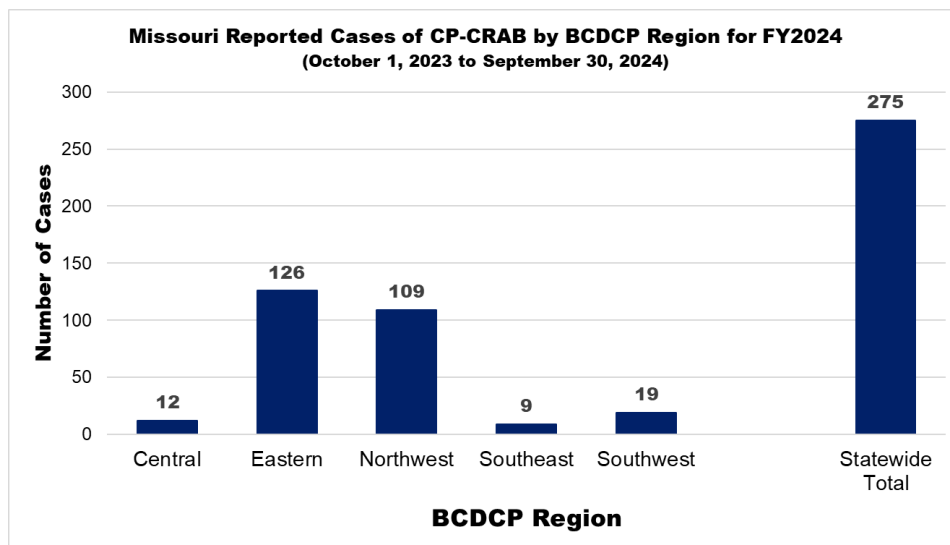


Figure 3: CP-CRAB cases

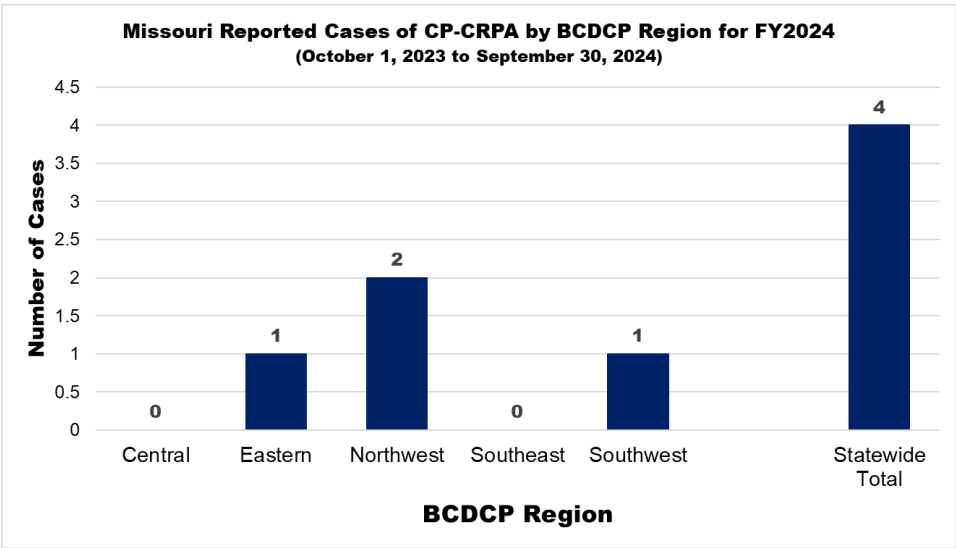


Figure 4: CP-CRPA Cases

Candida auris

Candida auris (*C. auris*) is an emerging fungal infection that has the potential to cause severe illness, mortality and spread between patients in healthcare facilities.¹¹ *C. auris* was first reported in Missouri in late 2020. Only two cases were reported in Missouri during the 2020 to 2022 period, and both cases were residents to states with known high incidence of *C. auris*. Since October 2023, Missouri DHSS HAI/AR Program has detected several cases of locally acquired *C. auris*, with the majority of these cases being identified in the St. Louis Metro Area.¹¹

C. auris is often very resistant to first-line antifungal medications, increasing the difficulty to treat this organism. Individuals may or may not have any signs or symptoms of an active infection when this organism is identified. When an individual is identified as having *C. auris* but has no clinical signs or symptoms of an active infection, this is referred to as “colonization”. Even though the colonized individual may not have an active infection, they can still spread *C. auris* to other patients by their hands, medical devices, or high-touch surfaces. Conducting colonization screenings for individuals within healthcare facilities is an important method to identify and prevent the spread of *C. auris*.¹²

Even though most *C. auris* cases have been identified in the Eastern and Southeastern Regions of Missouri, patients can be transferred to any healthcare facilities across the state. Neighboring states have also detected *C. auris* cases. Given that individuals may also be transferred across state lines, surveillance and screening activities should be performed in all regions within the state. The HAI/AR Program partners with healthcare facilities to provide colonization screening guidance, as well as coordinate efforts for receiving and shipping screening supplies for testing.

C. auris is immediately reportable to DHSS per 19 CSR 20-20.020, as this organism is an unusual, emerging disease with substantial risk to public health.

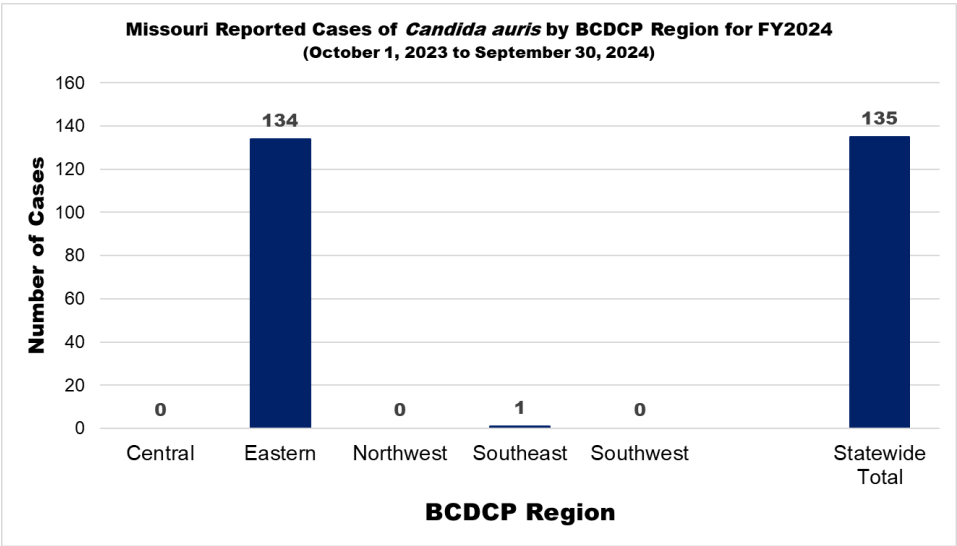


Figure 5: *C. auris* cases

Additional Efforts from the HAI/AR Program

The HAI/AR Program is a program under the Division of Community and Public Health within DHSS. It is a non-regulatory program that is collaborative in nature and aims to be a free and openly available resource for all healthcare facilities and practices across the state of Missouri. Services and resources are available to all healthcare settings within the state, including long-term care and outpatient clinics. The HAI/AR Program provides focused assistance to healthcare facilities related to 3 core priority areas:

- Monitor and investigate MDRO cases
- Provide education related to MDROs
- Coordinate colonization screenings
- Coordinate MDRO molecular testing
- Collect and report HAI data to CDC

Epidemiology

- Assess gaps in IPC practices
- Conduct needs assessments for IPC
- Coordinate IPC education
- Improve IPC best practices statewide
- Promote "Project Firstline" initiatives

Infection Prevention

- Facilitate AS in all healthcare settings
- Conduct AS partnerships statewide
- Monitor antibiotic use in all settings
- Coordinate AS education statewide
- Assess gaps in AS practices

Antimicrobial Stewardship

Epidemiology

The HAI/AR Program has two Lead Epidemiologists and two Associate Epidemiologists that conduct epidemiological investigations of HAIs, including CPOs and *C. auris*. When a case is reported, the epidemiologists reach out to the healthcare facility reporting that case for more follow-up. This follow-up can consist of collecting investigation data,

consulting on infection prevention and control recommendations, and/or offering assisting services such as Infection Control Assessment and Review (ICAR) visits and colonization screenings. During the previous program year, over 500 investigations and consultations were completed. If a cluster or outbreak is identified, the HAI/AR Program responds quickly with consultations and on-site visits.

The epidemiologists coordinate with the Missouri State Public Health Lab (MSPHL) to assist facilities with microbiological testing, including CPOs and *C. auris*, especially for healthcare facilities that do not have that capability themselves. This has resulted in a marked increase in testing at MSPHL and reported HAIs, CPOs, and *C. auris* cases in Missouri. Epidemiologists also coordinate with the Minnesota State Public Health Lab, which is the Antimicrobial Resistance Lab Network partner for the US Central region, to test colonization screening samples from healthcare facilities. The samples are also sequenced to compare if there is relatedness between samples. The HAI/AR Program coordinated 28 colonization screenings with hospitals and long-term care facilities during the last program year.

The HAI/AR Program epidemiologists collect and maintain data to track trends in disease reports. This allows the HAI/AR Program to make data driven decisions to focus outreach, education, and response. The data is also reported to the CDC with summaries provided to various programs/bureaus within DHSS for situational awareness.

Infection Prevention

The HAI/AR Program has an Infection Prevention Nurse Specialist and three Public Health Environmental Officers that provide services related to infection prevention and control (IPC) practices. These services include provided targeted education to healthcare facilities and organizations and serving as subject matter experts to healthcare facilities with questions regarding IPC practices, via phone, email, or virtual consultations. The Public Health Environmental Officers have created presentations for various settings to address dedicated IPC topics. HAI/AR Program staff were able to present at 3 professional clinical organization meetings this year.

HAI/AR Program staff can coordinate a free, non-regulatory Infection Control Assessment and Response (ICAR) visit for healthcare facilities. ICAR visits are a collaborative review of healthcare facility IPC practices to identify and address potential opportunities of improvement. Facilities are provided with formal, evidence-based recommendations to help address any identified opportunities while also highlighting facility IPC successes. For the 2023-2024 program year, 3 onsite ICARs were performed at acute care and long-term acute care hospitals. There were 237 ICAR visits for long-term care facilities conducted by the University of Missouri, Sinclair School of Nursing ICAR team, through a grant partnership with the HAI/AR Program.

Antimicrobial Stewardship

The HAI/AR Program has one Antimicrobial Stewardship Pharmacist to serve as a subject matter expert related to antimicrobial stewardship efforts. These efforts include tracking antibiotic utilization in healthcare facilities across the state, conducting collaborative reviews with individual healthcare facilities to assess their antimicrobial stewardship practices, and providing targeted education related to antimicrobial resistance and antimicrobial use tailored to healthcare facility and organization needs. As an initial kick-off of these efforts, a dedicated playbook for antimicrobial stewardship in long-term care facilities was created and distributed to these facilities throughout the state.

For fiscal year 2024, the Missouri DHSS HAI/AR Program partnered with Washington University through a federal grant opportunity to help examine and construct a foundation for antimicrobial stewardship within the state of Missouri. This foundation is meant to provide the framework on strategies for approaching antimicrobial stewardship from the public health perspective. Efforts from this grant opportunity allowed for the creation of an antimicrobial stewardship program gap analysis tool to facilitate the collaborative review process and determine plausible data sources for tracking antimicrobial use across multiple healthcare facility types, including acute care and outpatient care settings. Another major effort from this grant opportunity included the assessment of outpatient antibiotic prescribing practices for both pediatric and adult patients. From this effort, the HAI/AR Program will be able to target two conditions for targeted education. For pediatric patients, acute otitis media (AOM), or “middle-ear infections” had the highest rate (75%) of inappropriate antibiotic therapy prescribed to patients. Acute bacterial rhinosinusitis (ABRS) had the highest rate (85%) of inappropriate antibiotic therapy prescribed in adult patients.

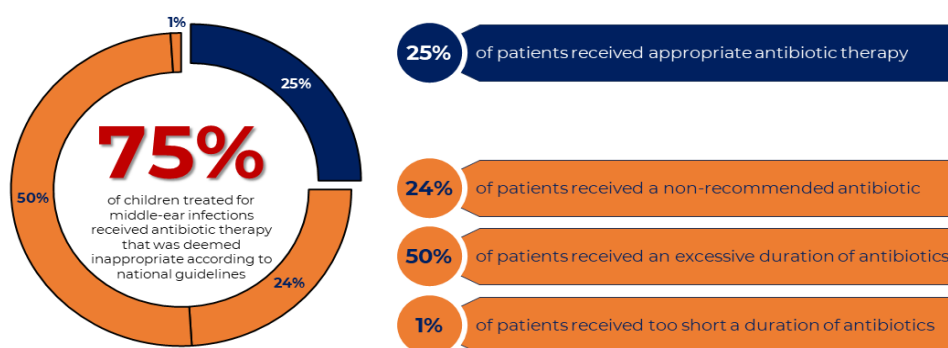


Figure 6: Appropriateness of Outpatient AOM Antibiotic Therapy in Children

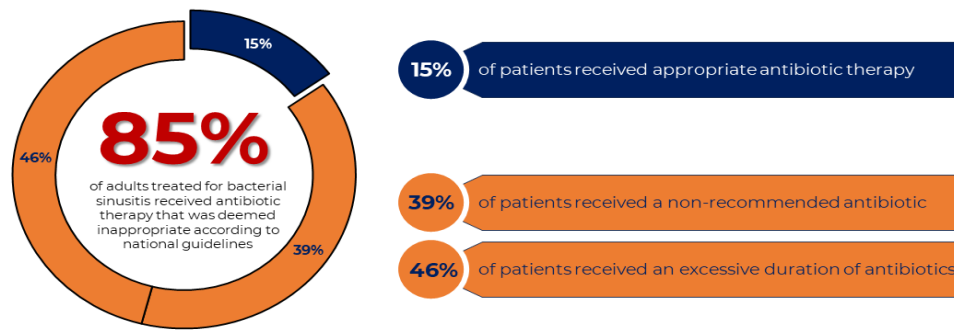


Figure 7: Appropriateness of Outpatient ABRS Antibiotic Therapy in Adults

Questions:

Any questions regarding this report should be directed to the Missouri Department of Health and Senior Services, Healthcare-Associated Infections/Antimicrobial Resistance Program: 573-751-6113.

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